SIS.NET2 CONTRIBUTION TO OPEN CONSULTATION ON NEXT WORK PROGRAMME 2018-2019(2020)

Developed by SiS.net^2 Expert Group - Barcelona 25th-26th April 2016

1. What are the challenges under "Science with and for Society" that require action under the Work Programme 2018-2020? And would they require an integrated approach across the societal challenges and leadership in enabling and industrial technologies?

The SwafS programme faces a good number of challenges ahead. The SIS.net2 network has identified the following clusters of challenges as real priorities that need to be tackled under the next WP, specifically by SwafS or by an integrated approach in all parts of H2020.

Cluster 1: Research on Open Science and its relation to RRI and other adjacent terms

During the last years a great effort has been put into establishing a coherent framework of RRI. The discourse of RRI has been reaching policy at national level and practical tools are now available for the application of RRI and its key issues. Now the 3 O's strategy is gaining presence in the SwafS programme and in the political discourse. We believe that more research is needed on the concept of Open science, the obstacles and motivations of stakeholders for its application and its relation with RRI and other adjacent terms.

Cluster 2: New approaches to gender issues

We need to open the concept of gender specific topics beyond implementation and evaluation of Gender Equality Plans in research organizations. It is also necessarily a focus for other issues such as:

- There is a need to research and undertake a more "profound and holistic approach to education" in H2020 programs beyond STEM, that comprises all research disciplines. Attracting girls into STEM fields and careers. This needs to be done early in the formal education system.

- Extended training on gender equality and gender mainstreaming priority of ERA, in order to get gender-skilled people. This, together with other RRI policy instruments, will facilitate a real approach to gender, rather than just formalist box ticking or empty words.

- Evidence-oriented research to provide data on the negative vs positive impact of gender-blind/biased vs. gender competent/transformative research (respectively) regarding costs

and benefits (social, economic, health-related, environmental, …). The results of this research topic can also be used as a helpful resource for training and awareness-raising activities.

Cluster 3: Time to make public/stakeholder engagement normative in H2020

RRI is somehow an umbrella that covers different issues and aspects. Some of the RRI dimensions have already become normative (as for example Open Access, gender and ethics) although there is still a long way to make them fully operative. Other dimensions are not yet included as a norm in H2020. Now is therefore the moment to try to make public/stakeholder engagement normative. There is a clear social support for the participation of the public in the decisions of science.

Cluster 4: Ensuring ownership of RRI concepts among researchers

RRI is a top down implemented concept and might produce some negative reactions for this reason. At the same time, its core values, the key issues that lay under its umbrella and its processes are commonly seen by researchers as positive (inclusiveness, reflexivity, openness, transparency). Moreover, researchers' own value bases and commitments are likely to be aligned with the core values of RRI. The close involvement of researchers themselves can enhance creation of ownership as this may mitigate the top-down effect.

Cluster 5: Science engagement with and for migrants and refugees

Europe is faced with a significant influx of migrants: hundreds of thousands of people fleeing from war and poverty are travelling to Europe in search of safety and a better life. The EU challenge will be to develop strategies to help refugee scientists and researchers in order to find suitable jobs that both improve their own situation and put their skills and experience to good use in Europe´s research system. Migrants and refugees are part of our reality and the EU responsibility is to include them in “society” recognizing the specificities of their pathways.

Cluster 6: Federating RRI communities

There is a challenge to unite the different stakeholders of the broad RRI community into a single common message. There are many existing RRI-related networks that can benefit by working together: ECSITE, EUSEA, LKN and ENOLL. The synergies among them will also enhance the visibility of RRI and will facilitate reaching the different target stakeholders: research community, education community, industry, policy-makers and civil society.

Cluster 7: Embedding of RRI throughout H2020

RRI should be represented in H2020 topics and should be taken into account and embedded at all stages of the proposal process, including the provision of resources to embed these concepts in the heart of projects, not just as another ticking box exercise in the administration. To demonstrate the possibilities of the impact of RRI on projects, pilots and demonstrators should be worked out.

Cluster 8: RRI-flagged topics in all programmes in H2020

Integrating RRI pillars adequately as cross-cutting issues in all SwafS topics is still a major challenge. Therefore, stronger mandates, guidelines and incentives for RRI are required. One way to do it is by means of a progressive increase in the proportion of RRI flagged topics in other H2020 programmes, following the way already started with the gender pillar, and extending it to other RRI pillars in order to highlight the topics in which the different RRI pillars are specially relevant.

Cluster 9: A mix between RRI specific research and RRI embedding in all parts of H2020

Although adequately integrating the different RRI pillars as cross-cutting issues is still a major challenge, RRI-specific research topics are necessary too. Therefore, it is recommended to include gender, public engagement and other RRI pillars as specific research topics to be funded, aimed at fostering the production of new knowledge for a better understanding of RRI issues (in addition to considering them as cross-cutting issues in all funding programmes).

Cluster 10: New measures for RRI

There is a clear consensus around the fact that we need new measures to capture RRI benefits. Traditional indicators on research performance are limited and are not able to measure social impact. We call for new measures that trace the link between RRI practices and social impact, as the way to measure excellence and performance. We also need a longer time frame in order to be able to fully incorporate the outcomes and results of the research.

2. What are the outputs/impacts that could be foreseen? Which innovation (understood in its broadest sense, including social innovation) related to "Science with and for Society" aspects could reach the market/societal deployment within 5-7 years?

Some of the main outputs would be on a methodological level, with well integrated, implemented and instituted approaches and co-creation along the lines of RRI throughout Horizon 2020. This will fulfil the long-term Europe 2020 strategy of a smarter, more sustainable and inclusive European economy and society.

Ongoing and future projects will use new methodologies and initiate an irreversible process of cultural change. The outcomes of future projects are therefore likely to better match the societal expectations, values and needs of European citizens.

Also, European citizens, especially young people will become more engaged and involved in research and innovation projects as well as in the societal discussions and consultations on science. This will result in a general public more interested in and aware of science and technology, with a better understanding of the science-society relationships, more willing to "invest" their own time and tax money into research and innovation – and possibly also their own resources through crowd-funding.

On policy level, a certain proportion – e.g. 3 percent – of the EC budget for research and innovation should be dedicated to RRI. RRI should also become one of the criteria all European

project proposals are evaluated against, which will turn the values of RRI (ethics, gender equality, open access, public engagement, science education and governance) into explicitly prioritized aspects in EU funded research and innovation.

3. Which gaps (science and technology, innovation, markets, policy) and potential game changers, including the role of the public sector in accelerating changes, need to be taken into account?

Gap 1: Institutional change is needed

Research producing organisations and funding agencies do not pay enough attention to RRI concepts yet, as they do not always see the importance of RRI as part of the policy of the institution and/or faculty and research group, nor in evaluation criteria. In many cases there is a lack of knowledge of some concepts and how the different RRI dimensions can uplift/enhance each other. There is also a clear lack of incentives and no clear requirements to take on RRI approaches. Extended mandatory trainings are needed and RRI should be taken into account of the financial accounting. RPOs and RFOs should take ownership of RRI since the concepts are mostly already implicitly embedded in their organisations.

Gap 2: Developing Governance for the advancement of RRI by all stakeholders

The SWAFS program calls upon the need to focus on developing Governance for the advancement of RRI by "all stakeholders", which is sensitive to the needs and demands of society and promote an ethics framework for research and innovation. In the light of recent financial and socio-economic crisis suffered by many EU countries, there is a growing demand for transparency, good governance and accountability not only for Governments and Institutions but also by mayor actors having a great impact in our economy and societal well being, namely the Banking sector.

Along these lines, research addressing possible innovative approaches for ethical and RRI applied to investment and banking and good practices would be needed on:

i) The incorporation of CSR and RRI principles into the Banking Sector within its own Business Plan and Core Mission
ii) Further exploring and developing innovative approaches for RRI within these areas of activity, such as Ethical Investment Portfolios and Stock Market Index...

Gap 3: Full reflection on Open Science

Research producing and funding institutions need a change of research culture towards open science. Proper recognition of research performance may be barriers for researchers to fully engage with Open Access, while publishers might not to be ready for changing their business plans that are often built on restricted access schemes to the publications.

In this scenario, it is necessary to foster a full reflection on open science. Researchers, research institutions, research funding institutions and publishers should start an open discussion on:

iii) real and fair costs of open science (to find how everybody would benefit financially from moving towards openness);
iv) benefits of open science for all parties involved (what are the pros and cons for researchers, research institutions, publishers, society);
v) what rewards should be given to the researchers and research institutions; how the evaluation criteria (these of research funding organisations and research institutions) support openness, e.g. deal with the fact that open access journals are generally at least "officially" given lower impact factors in high renowed databases, and many open access journals are not at all indexed there (in e.g.ISI Web of Knowledge).

Specifically on Open Access, a deep analysis of the real costs of Open Access for every group of actors are needed through evaluating the Open Access public policy so far, which will give a clearer picture of the opportunities and challenges in its implementation process. Especially interesting will be the analysis of research budget practices such as "double dipping" in the large scale, and the new roles that stakeholders should play in the forthcoming new scientific information market scenario. Moreover, a reflection on the new business models for publishers can be a leverage to overcome current barriers.

Game changer 1: Citizens attitudes and involvement

We are living a change of paradigm where the traditional dichotomy between knowledge users and knowledge producers becomes blurred. Bottom-up movements proliferate all over the world: crowdfunding, makers movements, living labs, citizen science, etc. Citizens are taking means to know more about science and to become more involved and influential. This situation opens opportunities not only for SwafS, but also for H2020 in general and acts as a game changer that should be taken into account. Moreover, youth has a great potential as group of innovators, which is ofter underestimated. Specific action should be put in place toleverage this potential, as for example a new format of grants for early career researchers, for pupils in schools and/or students at universities, in order to learn how to jump in the project-based collaborative world.

Game changer 2: Political decisions should be made to support RRI

RRI is mentioned in policy documents (at the European Commission level but often still not enough at national level) but is not enough supported in decisions. Decision makers should:
i) ensure sufficient resources for RRI (e.g. through different research and development grants);
ii) ensure translation of RRI into tangible practices in the fields of research (e.g. how it should be applied in engineering).

A key game changer is linking R&I funding opportunities within public sector to results and progress made on RRI by applicants (at institutional and/or team level). It can be done either by means of pre-conditions or eligibility requirements, and/or by evaluation criteria. In order to adequately implement this game changer, monitoring and accounting systems on all RRI dimensions should be improved and supported (at EU, national and institutional level).

This kind of measures is consistent with recent EU and European normative frameworks. For instance, inter alia, regarding the gender pillar, in October 15th 2014 the European Economic

and Social Committee, acting under Rule 29(2) of the Rules of Procedure, adopted an Own-initiative Opinion on Women in science (2015/C 012/02).

4. Which areas could benefit from the integration of horizontal aspects such as the social sciences and humanities, responsible research and innovation, gender aspects, and climate and sustainable development?

A more socially responsible way of doing research & innovation should fertilize all parts of H2020, though the spread of RRI in H2020 could have several phases. We can envisage a pilot for RRI throughout the pillar of Grand Challenges in the next Work Programme 2018-19. Subsequently, pilots could be introduced in the other two pillars – Excellent science and Industrial leadership – in the next Framework Programme:

RRI should be mainstreamed throughout the next Framework Programme (FP9). Efforts could be made with different intensity for the different RRI key issues, open access, gender equality and ethics, which still need more intense push. Public and stakeholder engagement has to be increasingly adopted and might need some soft normative tools too.

This is a realistic goal as open access is on its way to be established, ethics and gender are firmly on the agenda, and public engagement is ready to be addressed as the next priority for implementation.

In reaching the industry with requirements of RRI, the already established notion of Corporate Social Responsibility can act as a means to implement the keys of RRI.
In order to benefit from all results generated through projects funded within the FP7 Science in Society programme and the H2020 Science with and for Society programme, EC should initiate an overview and analysis of all the project outcomes, conclusions and lessons learned, resulting in a synthesis and a methodology toolbox. To fulfil this goal, EC may initiate a face-to-face panel of project coordinators (the projects focusing on RRI) who will meet regularly to discuss the progress and outcomes of each project. They should plan how to benefit from each other's work and how to maximize their impact.

The EC should also carry out a survey to investigate the benefits and challenges all SiS/SwafS project partners have experienced as well as suggestions for improvements to take into account when preparing the next Framework Programme. Furthermore, EC should dedicate sufficient funding for RRI research, which can improve the implementation of all RRI aspects within research and innovation.

5. Which policy instruments or initiatives should be supported by a) "Science with and for Society" and b) other parts of Horizon 2020, in order to optimally mainstream Responsible Research and Innovation (RRI) within and outside the European Union?

Policy instrument: ERA-net on RRI

A future ERA-Net on RRI/Open Science and Innovation could push member states and associated countries to work together to define processes and methods to implement RRI/Open Science and innovation on European and national levels. It would also highlight the importance of these questions on global, European and national policy level respectively.

This work may be also covered by a Coordination and Support Action, which may be easier to articulate and may be the seed for future ERA-net on RRI.

Policy initiative: Strong monitoring, accounting and evaluation system

In order to achieve an optimal mainstreaming of RRI, the RRI aspects must be fully and explicitly incorporated into the application and evaluation process of Horizon 2020 projects. Extra funding should be provided for adding RRI aspects into already EU funded projects. Furthermore, RRI rules should apply also for non-European partners.

This system should include the monitoring of RRI-flagged topics all over H2020 programmes, with a strong monitoring at the Work Programme design level (ensuring a minimum percentage of topics where RRI has a crucial role) and at monitoring level (ensuring the level of compliance with these requirements in the project implementation).

This evaluation system will also be a leverage to orient policy and be able to give feedback and incentives to institutions/research teams.

Policy initiative: A powerful legal policy framework will create a fruitful environment for the impact and possibilities of RRI, specifically Open Access and Open Data

Different aspects of RRI will only have an impact in an open, sustainable infrastructure. Funding for the interoperability of the tools and infrastructure used, based upon open standards and protocols is crucial.

- The current copyright review should include Text and Data Mining (TDM) as a mandatory exception to enable all parties who have legal access to the content to mine it with the tools of their choice, irrespective of their jurisdictional status as a natural or legal person.
- Publicly funded research must be made available to the public through Open Access, as it is a requirement in Horizon 2020 projects. In order to enable a full open access environment, the EC should provide for an exception that allows research organisations to distribute scientific publications of affiliated researchers through their own channels, such as publication repositories, also known as secondary publication.

Such visibility would improve the quality of research and stimulate further cooperation and valorisation.

- Openly sharing research data requires a clear legal framework, with among others clear rules on who has the right and who has the responsibility to decide on confidentiality, access and archiving.
- Since 2015 all member states should have adopted the Public Sector Information (PSI) directive. This directive requires public administrations to open data upon request. It would be highly beneficial for RRI concepts in research that public data would be made openly available by default, instead of waiting for a request. An add-on to the impact of these open data would be the inclusion of default sex disaggregated data.

6. Other ideas

During the participatory process to give response to the different questions, the SiS.net Expert Group has explored some ideas with a potential to become activities funded by next SwafS Work Programme. They are the following:

I. Filling the gaps for the implementation of Open Science

Open Science is a promising area and SwafS is seen as the right programme that allows the concept to be extended and implemented. For its implementation, some current needs should be taken into account:

- To design tools and resources to overcome the new costs and burdens of the European Open Access policy regarding scientific publishing and access to scientific journals for researchers, especially at national level.
- To evaluate the implementation of the European Open Access policy, making clear differences among each stakeholder.
- To analyse the outcomes from the Open Data Pilot and to design a solid and realistic roadmap for a full implementation of the open data policy.
- To integrate all Open Science concepts into a common approach.

This will allow acquiring the optimal vision of Open Science and its implications for the European Research Area.

II. New approaches to measure research performance

The recognition of research merits and the opportunity cost of choosing an OA journal has been identified as main barriers to researchers adopting an Open Access mandate. Therefore, a key issue regarding Open Access and Open Science is how to cope with the research performance evaluation. We currently use the indexes provided by the main international publishers as a generally recognised proxy for excellence. However, we need to go beyond current metrics in order to develop a more reliable research assessment and evaluation. That is, a new Open Access friendly evaluation system.

We should also take into account the risk of no action at European level in this concern. As Open Access is already a mandate in several countries, different systems for research performance may be created nationally, which clearly hamper the construction of the European Research Area.

In addition to this, the EC should also promote a change in researchers' evaluation conditions. There are currently very few funders that do take into consideration Open Access publications or scientific dissemination activities for evaluation purposes. These EC movements towards changing dynamics within the research community should have an adequate correspondence in changing also evaluation criteria of researchers' performance.

III. Alternative ways for Ethics approval

Research needs to be conducted on alternative ways of addressing research ethics and providing formal ethical approval for research projects in fields in which such formal procedures are yet to be established. In some areas of research, resistance towards the establishment of procedures including formal ethical approval is often present. Moreover, constructing research ethics committees can be conflictual as the researchers' interest in protecting their academic freedom may clash with the regulatory interests of funding bodies, policy makers, industry and/or research administrators.

The expected impact is an increased understanding of the motivations of researchers to resist the establishment of formalized ethical review processes on the one hand, and their interpretations of the scope and limits of ethically appropriate research in their own field on the other hand. These findings can contribute to the establishment of alternative ethics review procedures that are tailored to particular fields of research which do not fully rely on the much followed biomedical regime but rather build on the inner logic of research fields by exposing their commitments and values with regard to good and appropriate research. New models for research ethics review grounded in the specific values and practices of particular fields of research will be presented with the expectation that they are a better fit than can be provided by imposed procedures external to the field.

IV. Encouraging girls in primary and early secondary education to choose IT/STEM subjects

Often girls make career-limiting choices in their selection of subjects in secondary school – e.g. choosing low-level maths. This restricts their choice of higher education fields and future careers. The shortage of IT professionals/engineers is exacerbated by the reduced pool of graduates with appropriate qualifications – this is particularly the case regarding young women. Innovation in science requires – besides ideas – also application, and this cannot be done without IT/engineering.

Therefore, any activities with this goal should target primary education and maximum early secondary education to have a real effect on career selection.

Some examples of such encouragement (although many other activities can be applied, freedom to the applicant to propose the methods):

- Female role models (IT professionals, engineers) visiting schools and speaking to pupils and parents. The involvement of parents will also contribute to public engagement. It is important to demonstrate that STEM careers do not solely correspond to the image of backroom-nerds. Client communication is vital and emphasizing this aspect of STEM careers may make them more attractive.
- Career counselling: the good career prospects for IT professionals/engineers need to be made known to young secondary school pupils (of course, this encouragement

should be given to boys, as well as girls.) It is especially important that pupils understand the risks of taking no or low-level maths subjects.

SIS.NET CONTRIBUTION TO DISCUSSION ON NEXT WORK PROGRAMME 2018-2019(2020)

Developed by SiS.net Expert Group[1] - Barcelona 25th-26th April 2016

Chairperson: Ignasi López, Director of the Department of Science and Fellowships, "la Caixa" Banking Foundation[2]
Rapporteur: Rocío Castrillo, Spanish Ministry for Economy and Competitiveness, SwafS NCP[3]

This document comprises the summary of the different views, ideas and contributions from the SiS.net Expert Group meeting in Barcelona on 25th and 26th of April. The meeting focused on making a common reflection on the SwafS future scenario for Work programme 2018-2019(2020): the challenges, gaps, opportunities of SwafS but also the interaction of SwafS with other programmes and the role of RRI as a cross-cutting issue.

The full list of members is included in Annex I, indicating those attending the Barcelona meeting. The SiS.net network takes the opportunity to sincerely thank them for the rich discussion and the intensive work of the two days meeting in Barcelona.

The discussion was structured under the same questions provided to the European Commission Advisory Group, in order to ensure its potential intake to a lively debate.

The group is open to provide any further clarification of the ideas included in this document. The group has counted with Ignasi López as a chairperson of the group, who may be contacted for additional explanation. Moreover, any other concern can also be shared with the SiS.net NCP network through Rocío Castrillo.

[1] Full list of members is included in Annex I
[2] Contact details: Ignasi López (ilopez@fundaciolacaixa.org, phone +34 93 404 49 89)
[3] Contact details: Rocío Castrillo (rocio.castrillo@oficinaeuropea.es, phone number +34 91 603 73 69).

1. What are the challenges under "Science with and for Society" that require action under the Work Programme 2018-2020? And would they require an integrated approach across the societal challenges and leadership in enabling and industrial technologies?

The SwafS programme faces a good number of challenges ahead. Moreover, Responsible Research and Innovation was recognized as a cross-cutting issue for Horizon 2020, aiming at including RRI horizontally in all parts of H2020. However, at this time when almost half of the H2020 life has already passed, there is still a long way to walk to this become a reality. The group has identified the following clusters of challenges as real priorities that need to be tackled under the next Work Programme, specifically by SwafS or by an integrated approach in all parts of H2020.

Cluster 1: Research on Open Science and its relation to RRI and other adjacent terms

During the last years a great effort has been put into establishing a coherent framework of RRI. The Go4 projects – GREAT, Res-Agora, Responsibility, and ProGReSS – funded in February 2013 with this objective, presented their results in their final joint conference in January 2016. Other projects – as RRI Tools, Heirri or Responsible industry – have been (and are still) developing the framework into practical applications. The discourse of RRI has been reaching policy at national level and practical tools are now available for the application of RRI and its key issues. Now the 3 O's – open science, open innovation, open to the world – strategy is gaining presence in the SwafS programme and in the political discourse. But, what is the deep meaning of Open science? How much Public engagement is in it? Which are its main values and how is it applied? We believe that more research is needed on the concept of Open science, the obstacles and motivations of stakeholders for its application and its relation with Responsible Research and Innovation and other adjacent terms.

Regarding Open Science, a proper articulation and delimitation of the concept can be useful, including meaningful openness, Open policy (how to reuse the information) and the changing paradigm of science journalism.

Cluster 2: New approaches to gender issues

We need to open the concept of gender specific topics beyond implementation and evaluation of Gender Equality Plans in research organizations. It is also necessarily a focus for other issues such as:

- Attracting girls into STEM fields and careers. This needs to be done early in the formal education system (late primary, early secondary) – it is often too late to leave encouragement until university admission since decisions regarding careers are made earlier with the choice of subjects in secondary education.

- Extended training on gender equality and gender mainstreaming priority of ERA, in order to get gender-skilled staff (including top managers), peer-reviewers/evaluators and researchers, both on the gender balance issues (in research institutions and decision-makings committees, panels etc.) and on Integrating Gender Analysis into Research (IGAR)

issues (in the content of R&I projects, programmes and policies). This, together with other RRI policy instruments, will facilitate a real approach to gender, rather than just formalist box ticking or empty words.

- Evidence-oriented research to provide data on the negative vs positive impact of gender-blind/biased vs. gender competent/transformative research (respectively) regarding costs and benefits (social, economic, health-related, environmental, …). The results of this research topic can also be used as a helpful resource for training and awareness-raising activities.

Cluster 3: Time to make public/stakeholder engagement normative in H2020

RRI is somehow an umbrella that covers different issues and aspects. Some of the RRI dimensions have already become normative (as for example Open Access, gender and ethics) although there is still a long way to make them fully operative. Other dimensions are not yet included as a norm in H2020. Now is therefore the moment to try to make public/stakeholder engagement normative. There is a clear social support for the participation of the public in the decisions of science. Projects as Engage2020 have done a lot for the understanding of its benefits and for raising awareness on its methods. And engagement has been sufficiently softly requested in different parts of H2020. Some stakeholder engagement activities could be requested as a pilot in some parts of H2020 (as for the Data Management Plan pilot). An ERA-NET on RRI including Public engagement could be an appropriate policy tool for its implementation at national level (further information is provided under question 5 about "Public instruments and initiatives").

Cluster 4: Ensuring ownership of RRI concepts among researchers

RRI is a top down implemented concept and might produce some negative reactions for this reason. At the same time, its core values, the key issues that lay under its umbrella and its processes are commonly seen by researchers as positive (inclusiveness, reflexivity, openness, transparency). Moreover, researchers' own value bases and commitments are likely to be aligned with the core values of RRI. They may be used as a driver to ensure the ownership of RRI.

How to ensure the ownership of the concept then among researchers? Training and capacity building has to be done to RFO and RPO's intensively throughout Europe. Building on the existing projects, the meaning of RRI in the different R&I sectors has to be developed and made accessible to researchers. The close involvement of researchers themselves can enhance creation of ownership as this may mitigate the top-down effect.

Cluster 5: Science engagement with and for migrants and refugees

Europe is faced with a significant influx of migrants: hundreds of thousands of people fleeing from war and poverty are travelling to Europe in search of safety and a better life. The EU challenge will be to develop strategies to help refugee scientists and researchers in order to find suitable jobs that both improve their own situation and put their skills and experience to good use in Europe´s research system. Migrants and refugees are part of our reality and the EU responsibility is to include them in "society" recognizing the specificities of their pathways.

Cluster 6: Federating RRI communities

There is a challenge to unite the different stakeholders of the broad RRI community into a single common message. There are many existing RRI-related networks that can benefit by working together: ECSITE (European Network Science centres & museums), ECSA (European Citizen Science Association), EUSEA (European Science Events Association), LKN (Living Knowledge – European Science Shops Association) and ENOLL (European Network of Living Labs), etc. The synergies among them will also enhance the visibility of RRI and will facilitate reaching the different target stakeholders: research community, education community, industry, policy-makers and civil society.

Cluster 7: Embedding of RRI throughout H2020

RRI should be represented in H2020 topics and should be taken into account and embedded at all stages of the proposal process, including the provision of resources to embed these concepts in the heart of projects, not just as another ticking box exercise in the administration. To demonstrate the possibilities of the impact of RRI on projects, pilots and demonstrators should be worked out.

Contrary to what many stakeholders think, producers, users, managers and every person taking part in research still need awareness and training on RRI related skills and knowledge, at every stage of one's career. From early in life up to senior positions, both in research and industry, from public profiles to private environments, people need to be instructed on RRI.

Especially regarding Open Access and Open Data, RRI can only prosper in a trustworthy and high-quality infrastructure. An e-infrastructure for research comprises of more than research results, including research data. It also provides data and insights in the statistics of the system, uses open standards and protocols and consists of elements like repositories, innovative publishing models and solutions in the cloud. This infrastructure and its elements work along the FAIR principles (Findable, Accessible, Interoperable and re-usable) and have procedures for preservation.

Although it may be considered a minor problem, language reveals hidden prejudice. That is why an adaptation of language in RRI concepts is needed. Some examples to be taken in consideration: don't talk about "science" but about "scholarship" or "research" since in many minds science only comprises STEM. Gender is still an issue in project jargon. People use "man months" instead of "person months" for example, or "chairman" instead of "chairperson".

Cluster 8: RRI-flagged topics in all programmes in H2020

Integrating RRI pillars adequately as cross-cutting issues in all SwafS topics is still a major challenge. Therefore, stronger mandates, guidelines and incentives for RRI are required. One way to do it is by means of a progressive increase in the proportion of RRI flagged topics in other H2020 programmes, following the way already started with the gender pillar, and extending it to other RRI pillars in order to highlight the topics in which the different RRI pillars are specially relevant. The scoring system should ensure that proposals in gender and other RRI pillar flagged topics that do not adequately integrate such pillars in the research content cannot be accepted.

Other strategic resources aimed at facilitating good cross-cutting integration of RRI are extended training, awareness raising activities and dissemination materials on all RRI dimensions to RFOs staff, peer reviewers/evaluators and applicants.

The key guidelines and checklists for RFOs that the GENDER-NET ERA-Net presents in its Deliverable 3.11 (Manuals with guidelines on gendering research contents) can be applied to strengthen the integration of Gender Analysis into Research (IGAR) in H2020 and the next Framework Programme, and can also be useful for finding similar ways to strengthen the integration of other RRI pillars into research content (when/where relevant), together with the recommendations from the RRI tools project.

Cluster 9: A mix between RRI specific research and RRI embedding in all parts of H2020

Although adequately integrating the different RRI pillars as cross-cutting issues is still a major challenge, RRI-specific research topics are necessary too. Therefore, it is recommended to include gender, public engagement and other RRI pillars as specific research topics to be funded, aimed at fostering the production of new knowledge for a better understanding of RRI issues (in addition to considering them as cross-cutting issues in all funding programmes).

Cluster 10: New measures for RRI

There is a clear consensus around the fact that we need new measures to capture RRI benefits. Traditional indicators on research performance are limited and are not able to measure social impact. We call for new measures that trace the link between RRI practices and social impact, as the way to measure excellence and performance. We also need a longer time frame in order to be able to fully incorporate the outcomes and results of the research.

Moreover, RRI concepts are scarcely included in evaluation, assessment and review of programmes, projects or bids in projects. Transparent indicators, which mean they are openly and publically available, need to be taken into account to improve the evaluation system. As a consequence, research is not only mainly evaluated on impact factors and publications in the classical way.

2. What are the outputs/impacts that could be foreseen? Which innovation (understood in its broadest sense, including social innovation) related to "Science with and for Society" aspects could reach the market/societal deployment within 5-7 years?

Some of the main outputs would be on a methodological level, with well integrated, implemented and instituted approaches and co-creation along the lines of RRI throughout Horizon 2020. This will fulfil the long-term Europe 2020 strategy of a smarter, more sustainable and inclusive European economy and society.

Ongoing and future projects will use new methodologies and initiate an irreversible process of cultural change. The outcomes of future projects are therefore likely to better match the societal expectations, values and needs of European citizens.

Also, European citizens, especially young people will become more engaged and involved in research and innovation projects as well as in the societal discussions and consultations on science. This will result in a general public more interested in and aware of science and technology, with a better understanding of the science-society relationships, more willing to "invest" their own time and tax money into research and innovation – and possibly also their own resources through crowd-funding.

On policy level, a certain proportion – e.g. 3 percent – of the EC budget for research and innovation should be dedicated to RRI. RRI should also become one of the criteria all European project proposals are evaluated against, which will turn the values of RRI (ethics, gender equality, open access, public engagement, science education and governance) into explicitly prioritized aspects in EU funded research and innovation.

3. Which gaps (science and technology, innovation, markets, policy) and potential game changers, including the role of the public sector in accelerating changes, need to be taken into account?

Gap 1: Institutional change is needed

Research producing organisations and funding agencies do not pay enough attention to RRI concepts yet, as they do not always see the importance of RRI as part of the policy of the institution and/or faculty and research group, nor in evaluation criteria. In many cases there is a lack of knowledge of some concepts and how the different RRI dimensions can uplift/enhance each other. There is also a clear lack of incentives and no clear requirements to take on RRI approaches. Extended mandatory trainings are needed and RRI should be taken into account of the financial accounting. RPOs and RFOs should take ownership of RRI since the concepts are mostly already implicitly embedded in their organisations.

Gap 2: Full reflection on Open Science

Research producing and funding institutions need a change of research culture towards open science. Proper recognition of research performance may be barriers for researchers to fully engage with Open Access, while publishers might not to be ready for changing their business plans that are often built on restricted access schemes to the publications.

In this scenario, it is necessary to foster a full reflection on open science. Researchers, research institutions, research funding institutions and publishers should start an open discussion on:

i) real and fair costs of open science (to find how everybody would benefit financially from moving towards openness);
ii) benefits of open science for all parties involved (what are the pros and cons for researchers, research institutions, publishers, society);

iii) what rewards should be given to the researchers and research institutions; how the evaluation criteria (these of research funding organisations and research institutions) support openness, e.g. deal with the fact that open access journals are generally at least "officially" given lower impact factors in high renowned databases, and many open access journals are not at all indexed there (in e.g.ISI Web of Knowledge).

Specifically on Open Access, a deep analysis of the real costs of Open Access for every group of actors are needed through evaluating the Open Access public policy so far, which will give a clearer picture of the opportunities and challenges in its implementation process. Especially interesting will be the analysis of research budget practices such as "double dipping" in the large scale, and the new roles that stakeholders should play in the forthcoming new scientific information market scenario. Moreover, a reflection on the new business models for publishers can be a leverage to overcome current barriers.

Game changer 1: Citizens attitudes and involvement

We are living a change of paradigm where the traditional dichotomy between knowledge users and knowledge producers becomes blurred. Bottom-up movements proliferate all over the world: crowdfunding, makers movements, living labs, citizen science, etc. Citizens are taking means to know more about science and to become more involved and influential. This situation opens opportunities not only for SwafS, but also for H2020 in general and acts as a game changer that should be taken into account. Moreover, youth has a great potential as group of innovators, which is ofter underestimated. Specific action should be put in place toleverage this potential, as for example a new format of grants for early career researchers, for pupils in schools and/or students at universities, in order to learn how to jump in the project-based collaborative world.

Game changer 2: Political decisions should be made to support RRI

RRI is mentioned in policy documents (at the European Commission level but often still not enough at national level) but is not enough supported in decisions. Decision makers should:

i) ensure sufficient resources for RRI (e.g. through different research and development grants);
ii) ensure translation of RRI into tangible practices in the fields of research (e.g. how it should be applied in engineering).

A key game changer is linking R&I funding opportunities within public sector to results and progress made on RRI by applicants (at institutional and/or team level). It can be done either by means of pre-conditions or eligibility requirements, and/or by evaluation criteria. In order to adequately implement this game changer, monitoring and accounting systems on all RRI dimensions should be improved and supported (at EU, national and institutional level).

This kind of measures is consistent with recent EU and European normative frameworks. For instance, inter alia, regarding the gender pillar, in October 15th 2014 the European Economic and Social Committee, acting under Rule 29(2) of the Rules of Procedure, adopted an Own-initiative Opinion on Women in science (2015/C 012/02).

4. Which areas could benefit from the integration of horizontal aspects such as the social sciences and humanities, responsible research and innovation, gender aspects, and climate and sustainable development?

A more socially responsible way of doing research & innovation should fertilize all parts of H2020, though the spread of RRI in H2020 could have several phases. We can envisage a pilot for RRI throughout the pillar of Grand Challenges in the next Work Programme 2018-19. Subsequently, pilots could be introduced in the other two pillars – Excellent science and Industrial leadership – in the next Framework Programme:

RRI should be mainstreamed throughout the next Framework Programme (FP9). Efforts could be made with different intensity for the different RRI key issues, open access, gender equality and ethics, which still need more intense push. Public and stakeholder engagement has to be increasingly adopted and might need some soft normative tools too.

This is a realistic goal as open access is on its way to be established, ethics and gender are firmly on the agenda, and public engagement is ready to be addressed as the next priority for implementation.

In reaching the industry with requirements of RRI, the already established notion of Corporate Social Responsibility can act as a means to implement the keys of RRI.
In order to benefit from all results generated through projects funded within the FP7 Science in Society programme and the H2020 Science with and for Society programme, EC should initiate an overview and analysis of all the project outcomes, conclusions and lessons learned, resulting in a synthesis and a methodology toolbox. To fulfil this goal, EC may initiate a face-to-face panel of project coordinators (the projects focusing on RRI) who will meet regularly to discuss the progress and outcomes of each project. They should plan how to benefit from each other's work and how to maximize their impact.

The EC should also carry out a survey to investigate the benefits and challenges all SiS/SwafS project partners have experienced as well as suggestions for improvements to take into account when preparing the next Framework Programme. Furthermore, EC should dedicate sufficient funding for RRI research, which can improve the implementation of all RRI aspects within research and innovation.

5. Which policy instruments or initiatives should be supported by a) "Science with and for Society" and b) other parts of Horizon 2020, in order to optimally mainstream Responsible Research and Innovation (RRI) within and outside the European Union?

Policy instrument: ERA-net on RRI

A future ERA-Net on RRI/Open Science and Innovation could push member states and associated countries to work together to define processes and methods to implement RRI/Open Science and innovation on European and national levels. It would also highlight the importance of these questions on global, European and national policy level respectively.

This work may be also covered by a Coordination and Support Action, which may be easier to articulate and may be the seed for future ERA-net on RRI.

Policy initiative: Strong monitoring, accounting and evaluation system

In order to achieve an optimal mainstreaming of RRI, the RRI aspects must be fully and explicitly incorporated into the application and evaluation process of Horizon 2020 projects. Extra funding should be provided for adding RRI aspects into already EU funded projects. Furthermore, RRI rules should apply also for non-European partners.

This system should include the monitoring of RRI-flagged topics all over H2020 programmes, with a strong monitoring at the Work Programme design level (ensuring a minimum percentage of topics where RRI has a crucial role) and at monitoring level (ensuring the level of compliance with these requirements in the project implementation).

This evaluation system will also be a leverage to orient policy and be able to give feedback and incentives to institutions/research teams.

Policy initiative: A powerful legal policy framework will create a fruitful environment for the impact and possibilities of RRI, specifically Open Access and Open Data

Different aspects of RRI will only have an impact in an open, sustainable infrastructure. Funding for the interoperability of the tools and infrastructure used, based upon open standards and protocols is crucial.

- The current copyright review should include Text and Data Mining (TDM) as a mandatory exception to enable all parties who have legal access to the content to mine it with the tools of their choice, irrespective of their jurisdictional status as a natural or legal person.
- Publicly funded research must be made available to the public through Open Access, as it is a requirement in Horizon 2020 projects. In order to enable a full open access environment, the EC should provide for an exception that allows research organisations to distribute scientific publications of affiliated researchers through their own channels, such as publication repositories, also known as secondary publication. Such visibility would improve the quality of research and stimulate further cooperation and valorisation.
- Openly sharing research data requires a clear legal framework, with among others clear rules on who has the right and who has the responsibility to decide on confidentiality, access and archiving.
- Since 2015 all member states should have adopted the Public Sector Information (PSI) directive. This directive requires public administrations to open data upon request. It would be highly beneficial for RRI concepts in research that public data would be made

openly available by default, instead of waiting for a request. An add-on to the impact of these open data would be the inclusion of default sex disaggregated data.

6. Other ideas

During the participatory process to give response to the different questions, the SiS.net Expert Group has explored some ideas with a potential to become activities funded by next SwafS Work Programme. They are the following:

I. *Filling the gaps for the implementation of Open Science*

Open Science is a promising area and SwafS is seen as the right programme that allows the concept to be extended and implemented. For its implementation, some current needs should be taken into account:

- To design tools and resources to overcome the new costs and burdens of the European Open Access policy regarding scientific publishing and access to scientific journals for researchers, especially at national level.
- To evaluate the implementation of the European Open Access policy, making clear differences among each stakeholder.
- To analyse the outcomes from the Open Data Pilot and to design a solid and realistic roadmap for a full implementation of the open data policy.
- To integrate all Open Science concepts into a common approach.

This will allow acquiring the optimal vision of Open Science and its implications for the European Research Area.

II. *New approaches to measure research performance*

The recognition of research merits and the opportunity cost of choosing an OA journal has been identified as main barriers to researchers adopting an Open Access mandate. Therefore, a key issue regarding Open Access and Open Science is how to cope with the research performance evaluation. We currently use the indexes provided by the main international publishers as a generally recognised proxy for excellence. However, we need to go beyond current metrics in order to develop a more reliable research assessment and evaluation. That is, a new Open Access friendly evaluation system.

We should also take into account the risk of no action at European level in this concern. As Open Access is already a mandate in several countries, different systems for research performance may be created nationally, which clearly hamper the construction of the European Research Area.

In addition to this, the EC should also promote a change in researchers' evaluation conditions. There are currently very few funders that do take into consideration Open Access publications or scientific dissemination activities for evaluation purposes. These EC movements towards changing dynamics within the research community should have an adequate correspondence in changing also evaluation criteria of researchers' performance.

III. Alternative ways for Ethics approval

Research needs to be conducted on alternative ways of addressing research ethics and providing formal ethical approval for research projects in fields in which such formal procedures are yet to be established. In some areas of research, resistance towards the establishment of procedures including formal ethical approval is often present. Moreover, constructing research ethics committees can be conflictual as the researchers' interest in protecting their academic freedom may clash with the regulatory interests of funding bodies, policy makers, industry and/or research administrators.

The expected impact is an increased understanding of the motivations of researchers to resist the establishment of formalized ethical review processes on the one hand, and their interpretations of the scope and limits of ethically appropriate research in their own field on the other hand. These findings can contribute to the establishment of alternative ethics review procedures that are tailored to particular fields of research which do not fully rely on the much followed biomedical regime but rather build on the inner logic of research fields by exposing their commitments and values with regard to good and appropriate research. New models for research ethics review grounded in the specific values and practices of particular fields of research will be presented with the expectation that they are a better fit than can be provided by imposed procedures external to the field.

IV. Encouraging girls in primary and early secondary education to choose IT/STEM subjects

Often girls make career-limiting choices in their selection of subjects in secondary school – e.g. choosing low-level maths. This restricts their choice of higher education fields and future careers. The shortage of IT professionals/engineers is exacerbated by the reduced pool of graduates with appropriate qualifications – this is particularly the case regarding young women. Innovation in science requires – besides ideas – also application, and this cannot be done without IT/engineering.

Therefore, any activities with this goal should target primary education and maximum early secondary education to have a real effect on career selection.

Some examples of such encouragement (although many other activities can be applied, freedom to the applicant to propose the methods):

- Female role models (IT professionals, engineers) visiting schools and speaking to pupils and parents. The involvement of parents will also contribute to public engagement. It is important to demonstrate that STEM careers do not solely correspond to the image of backroom-nerds. Client communication is vital and emphasizing this aspect of STEM careers may make them more attractive.
- Career counselling: the good career prospects for IT professionals/engineers need to be made known to young secondary school pupils (of course, this encouragement should be given to boys, as well as girls.) It is especially important that pupils understand the risks of taking no or low-level maths subjects.

ANNEX I. List of experts

Expert Group

Name	Affiliation	Role	Participation at the Barcelona meeting
Ignasi López	Coordinator RRI tools, Fundación Bancaria "la Caixa", Spain	Chairperson	YES
Marjo Rauhala	Institute of Design & Assessment of Technology Centre for applied assistive technologies (AAT), Austria	Expert	YES
Ana Puy	Women and Science Unit Director UYMC-MINECO, Spain	Expert	YES
Tiia Raudma	Adviser in Higher Education Department, Ministry of Education and Research	Expert	YES
Pilar Rico	Open Access to scientific information and Open Repositories Unit, FECYT, Spain	Expert	YES
Inge Van Nieuwerburgh	Scholarly communication coordinator, Ghent University Library, Belgium	Expert	YES
Catherine Franche	Executive Director Ecsite, Belgium	Expert	YES
Cissi Askwall	General Secretary, VA (Public & Science), (CSO) Sweden	Expert	YES
Margus Pedaste	Coordinator of the project "Ark of Inquiry", University of Tartu, Estonia	Expert	YES
Reetta Kettunen	Secretary General, Committee for Public Information, expert body attached to the Ministry of Education and Culture, Finland	Expert	YES
Jack Stilgoe	Governance of science and emerging technologies and public engagement with science, UCL, UK	Expert	NO
John Crowley	Chief of Section Sector for Social and Human Sciences, UNESCO, UK	Expert	NO
Fredrik Bondestam	Unit of Gender Research, University of Gothenburg, Sweden	Expert	NO
Norbert Steinhaus	Citizen Participation in Science and Technology Science shop Bonn (CSO), Germany	Expert	NO
Mikkel Bohm	Director at Astra (National Centre for Science Education), Denmark	Expert	NO

NCP contributors

Name	Affiliation	Role	Participation at the Barcelona meeting
Rocío Castrillo	Ministry for Economy and Competitiveness, Spain	Rapporteur	YES

Michalis Tzatzanis	Austrian Research Promotion Agency, Austria	Contributor	YES
Alla Jonsdottir	Embassy of Iceland in Brussels, Iceland	Contributor	YES
Carolina Rodriguez	Andalucia Research Agency, Spain	Contributor	YES
Mar Mesas	Ministry for Economy and Competitiveness, Spain	Contributor	YES
Terje Tuisk	Estonian Research Council	Contributor	NO